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GRAPHEME-PHONEME REGULARITY AND ITS EFFECTS ON EARLY READING--A PILOT STUDY.

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A PILOT EXPERIMENT CONDUCTED TO TEST THE EFFECT OF A SPECIALLY DEVISED PHONIC APPROACH TO EARLY READING IS DESCRIBED. THE PHONIC METHOD USED ACHIEVED SOUND-SYMBOL REGULARITY AND HAD THE FOLLOWING CHARACTERISTICS--(1) CONSONANT GRAPHEMES EACH REPRESENTED ONLY ONE SOUND AND WERE PRINTED USING NEARLY STANDARD ALPHABETIC SYMBOLS. (2) EACH VOWEL PHONEME WAS ASSOCIATED WITH A COLOR, AND THE GRAPHEMIC REPRESENTATION OF THE VOWEL WAS PRINTED IN THAT COLOR. FOR EXAMPLE, THE E IN HE, THE EA IN MEAT, AND THE Y IN HAPPY WERE ALL PRINTED IN BLUE. (3) UNSOUNDED, OR SILENT LETTERS, SUCH AS THE B IN LAMB WERE SYMBOLIZED BY OUTLINE LETTERS. A SPECIAL FONT WAS DESIGNED TO MINIMIZE VISUAL CONFUSIONS. SUBJECTS WERE 20 5-YEAR-OLDS ATTENDING A PRIVATE KINDERGARTEN IN A SUBURBAN MIDDLE-CLASS COMMUNITY. TECHNIQUES AND MATERIALS USED DURING THE 7-MONTHS TEACHING PERIOD ARE DESCRIBED. ACHIEVEMENT WAS MEASURED BY FOUR SPECIAL TESTS DESIGNED FOR THE EXPERIMENT AND THE METROPOLITAN ACHIEVEMENT TEST ADMINISTERED UNDER STANDARD CONDITIONS. RESULTS INDICATED THAT WITH SUCH A SYSTEM CHILDREN WITH MENTAL AGES UNDER 7 COULD LEARN TO READ AND TO GENERALIZE TO STANDARD PRINT WITHOUT FORMAL TRAINING. SAMPLE INSTRUCTIONAL MATERIALS, TEST ITEMS, TABLES, AND FIGURES ARE INCLUDED. (RH)

UNIVERSITY OF PITTSBURGH - LEARNING R&D CENTER

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Grapheme-Phoneme Regularity and its Effects on Early Reading: A Pilot Study

Paul M. Kjeldergaard and Roselyn Frankenstein

Several experimental innovations in the area of beginning reading have been introduced in the past decade in an attempt to simplify the initial reading process. One class of innovation is the use of material selected so as to regularize sound-symbol correspondence. A second technique, also designed to achieve sound-symbol regularity, is the use of special symbols to represent phonemes; these symbols are eventually replaced by the standard orthography as the child builds up skill in the decoding process.

This paper will relate the results of a pilot experiment in which a group of five year olds were taught to read by a phonic method with specially devised materials based upon a hybrid system, a system that combined both vocabulary selection and special symbols to simplify the initial reading task. The system had the following characteristics:

1. Consonant graphemes each represented only one sound and were printed using nearly standard alphabetic symbols.

2. Each vowel phoneme was associated with a color and the graphemic representation of the vowel was printed in that color. For example, the e in he, the ea in meat, and the y in happy were all printed in blue.

3. Unsounded, or silent letters such as the k in knowledge, the b in lamb, and the e in came were symbolized by outline letters.

These three factors permitted a large proportion of English words to be printed in a correctly spelled form yet maintained complete sound-symbol regularity.

An additional feature of the system was the design of a special font. This font was similar to standard print but was devised to minimize the visual confusions which often plague the young reader. To minimize reversals, no letter was a mirror image of any other letter; no letter was an inversion of any letter; and no letter was a mirror image of an inversion. Since the b-d reversal is an especially difficult problem for some children, the

letter b was printed with the stem tilted 20 degrees counterclockwise. Stimulus generalization was minimized in two ways. In some cases, minor modifications were made in the type face--for example, the stem on the letter h was elongated to make it more distinguishable from the letter n. Secondly, the most discriminable form of a letter was selected from its alternative representations--for example, the typewriter a as opposed to its manuscript form was utilized.

To provide materials to test the system, readers were written and Appleton-Century-Crofts provided experimental editions in the special type face described. With the exception of story titles and incidental print in the illustrations, all print in the first two readers was in lower case. Punctuation was separated from words so as not to destroy the visual configuration of the words. The readers had two additional instructional features designed to still further simplify the initial reading task. First, phonemes were introduced sequentially. The order of presentation was determined primarily by the frequency of the phoneme in print and to a lesser extent by the visual discriminability of the associated grapheme and the auditory discriminability of the sound. The first story was based upon nine phonemes and one sight word, the article the. Subsequently, a story followed the introduction of each phoneme. As far as possible within the restrictions of the system, the sentence structures of the stories mirrored natural language patterns.

The second simplifying feature was that sentence length and sentence complexity increased gradually throughout the program. In the first story, the modal sentence length was four words and all sentences were simple sentences. By the end of the program, sentence patterns were varied and the average sentence length was significantly longer. This progression is illustrated in the contrast of Figure I, a page from the first story, with Figure II, a page from near the end of the second reader. It is easy to see the emergence of both sentence and vocabulary complexity. Similarly, figure IIa shows both mean sentence length and story length for the first reader.

In writing these readers, there was no systematic attempt at word repetition. Rather, repetition of phonemes and phoneme-grapheme relationships was emphasized. The consequence of this emphasis can be seen by examining the vocabulary of the first reader. It contains 174 basic words which occur a total of 1130 times. Contrast this, which represents less than 1/4 of the first year's materials, with the vocabulary load of many of the popular first grade reading programs in current use.

Let us now turn to the pilot study where these materials were first tested.

The subjects consisted of 20 children, five years of age, who were attending a private kindergarten in a middle class suburban community. Table I provides additional information about the subjects in terms of pre-test skills and the relationship of these tests with the post test results.

Procedure--Total reading instruction was confined to approximately twenty minutes a day for a truncated school year extending roughly from October to mid May; therefore, the most advanced students were only exposed to approximately 60% of what we estimate to be the contents of the first year's material. Only 23 of the English phonemes and their most frequent graphemic representations were formally taught. The formal reading process was preceded by a period of approximately three weeks, during which the children were given training in sound discrimination and oral blending and then placed into one of three relatively homogeneous and compatible groups for instructional purposes.

In addition to the readers, a variety of techniques and materials were used during the seven-month teaching period. Certain methods were common to the whole program--for example, blending each new phoneme with previously introduced phonemes to generate the vocabulary words used in a story. Each story in the reader was preceded by a phonics page which contained pictures of the objects starting with the new sound to be learned. The vocabulary which stressed that sound was presented on the same phonics page. A sample phonics page is shown in Figure III.

Results--Two sets of results will be presented for you to appraise the program. First the scores of the subjects on four special tests which were administered at the end of the first reader--two tests were colored coded to test variables within the program and two tests were printed in black and white to test generalization to standard print. Sample test items are presented in Figure IV. One test in each mode was multiple choice; the correct response involved circling a noun that was represented by a picture. The two remaining tests, one in color and one in black and white, consisted of isolated words which were administered as individual oral reading tests. The results of these four tests are presented in Table II. Inasmuch as the proportion of previously untaught words in each test was uniformly high (mdn = 62%) the results indicate both high achievement and strong generalization. Further, an item analysis of these four tests demonstrated that the children were homogeneous in performance. The errors were consistent across subjects, confined to relatively few items, and in general could be attributed to specific variables which were ammenable to correction. For example, the word knee proved difficult for all children, but only one vocabulary word, kneel, had involved the initial silent k and no other initial silent letter had been presented.

The second set of results are those obtained on the Metropolitan Achievement Test administered at the end of April under standard conditions. These results are especially encouraging in view of the fact that this test required generalization to new graphemes, phonemes, and a wide range of previously untaught skills. The median grade equivalent scores and the ranges adjusted for the truncated school year are presented in Table III. The score on the subtest entitled reading may at least partially be accounted for by the cumulative effects of trying to read a paragraph in which only a fraction of the words can be decoded and by the fact that the skills called for here were never practiced. The performance of many of the children indicated that they did not even understand the directions for this subtest.

Conclusion--It may be said that although these results are not definitive,

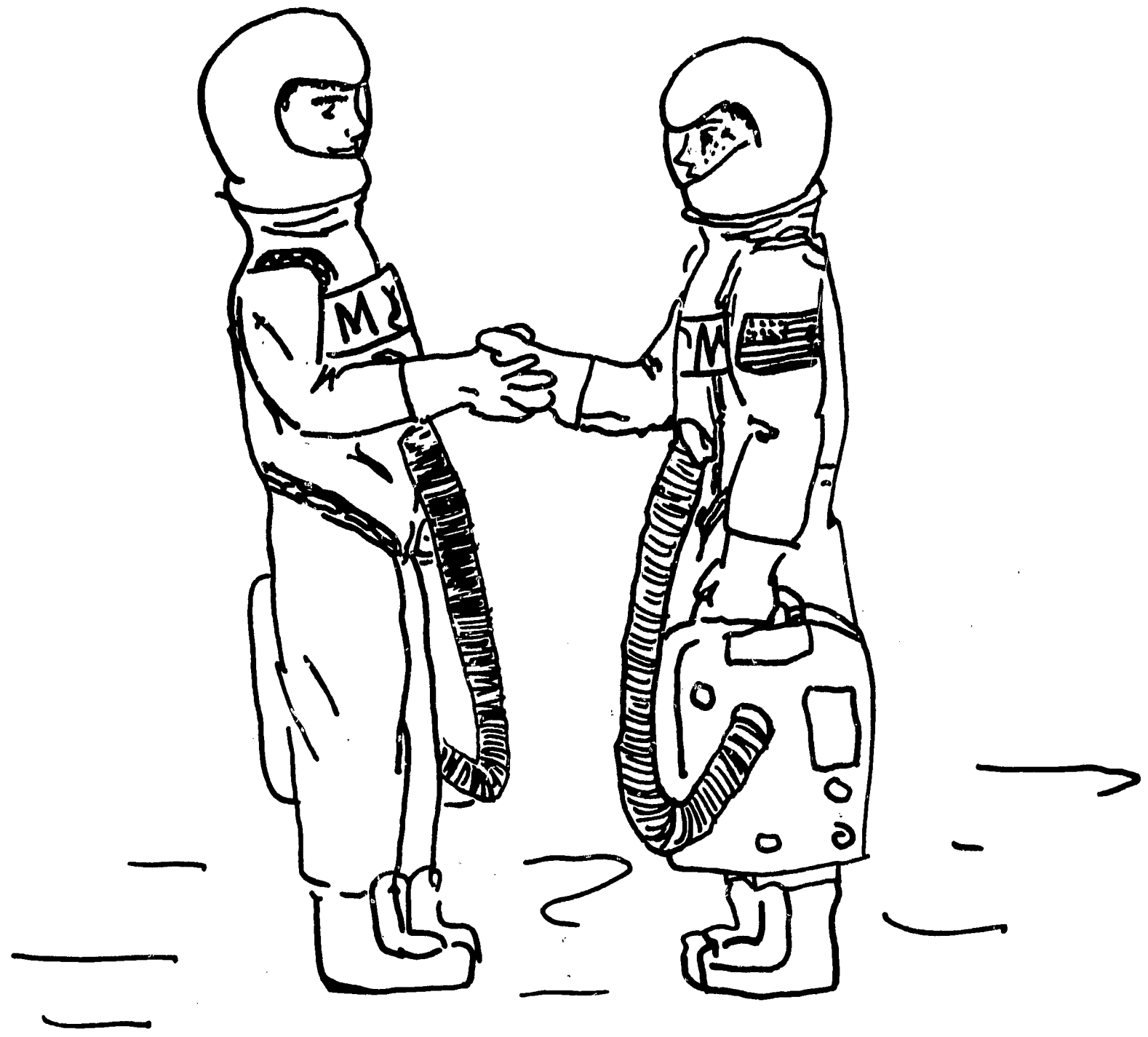
for there is no adequate baseline against which to compare these children, the following conclusions seem justified:

1. With the aid of a special system designed to regularize sound-symbol correspondence, children with mental ages less than seven can learn to read by a phonic method.

2. Children so taught with these special materials are able to generalize to standard print without formal training.

3. Preschool children can be taught to read by small group instruction.

Considered in the light of the restricted amount of formal training and with exposure to approximately one half of the projected first year's material, the results suggest that this is a promising new approach to beginning reading.



matt met sam .
sam and matt met .

"

Figure 1

Sample page from the first story of Book I

bess and bill fly and find the seeds . pete sits in the nest and sleeps . mittens sneaks back and climbs the pine . he peeks at pete in the nest. he sniffs pete's tail . pete sees mittens . "help!" he peeps .

Figure II
Sample page from the fifth story of Book II

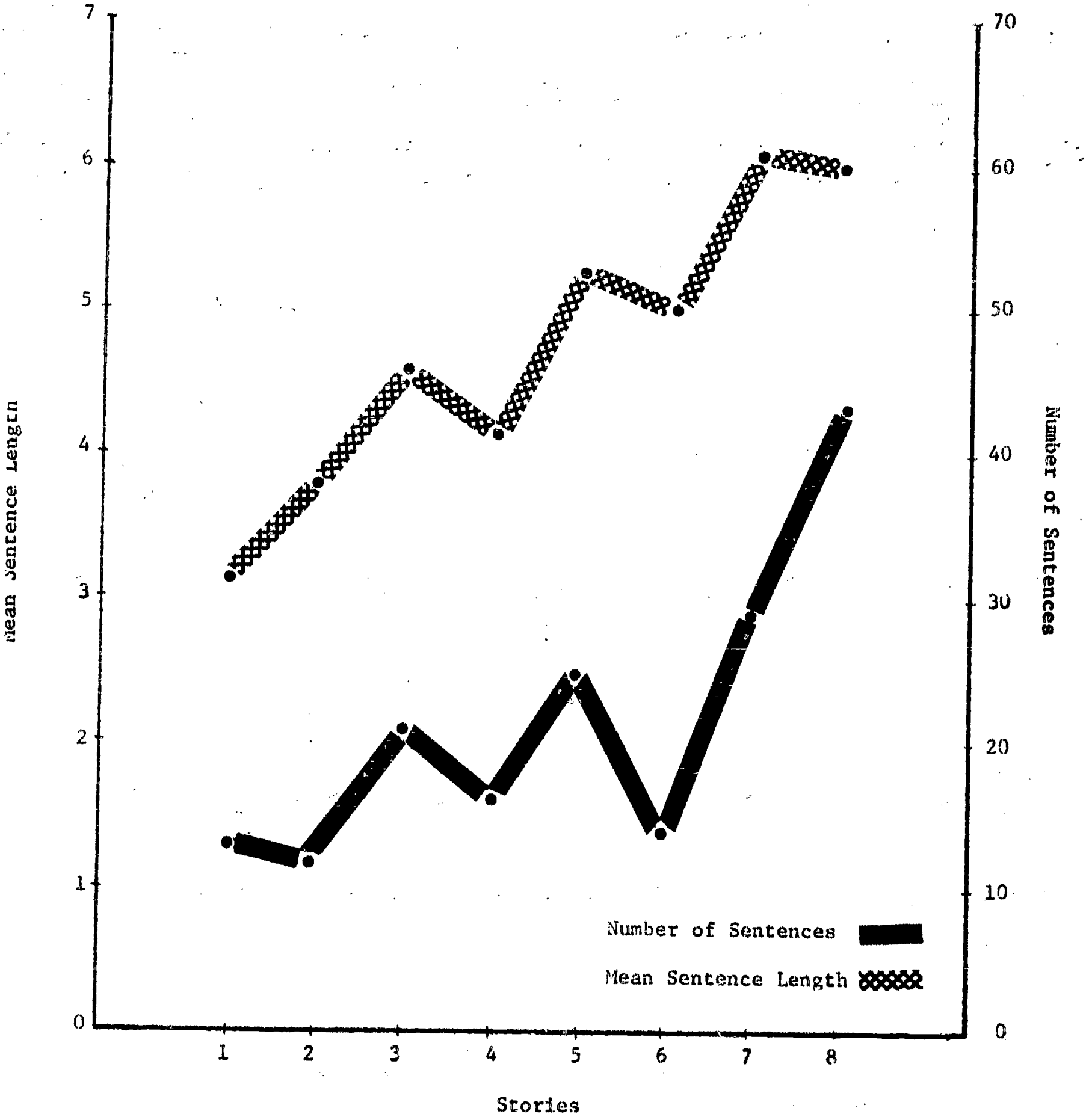
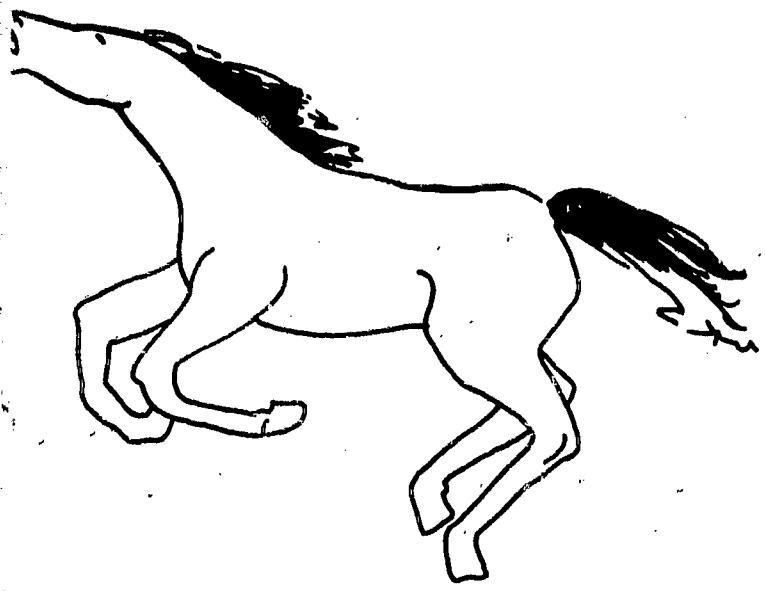
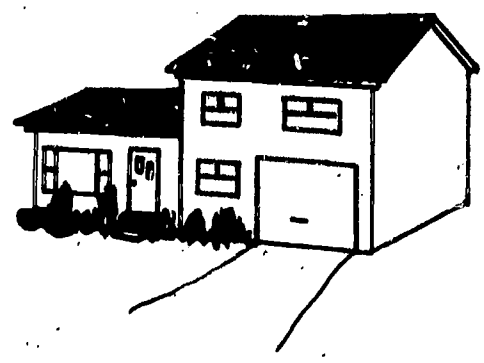


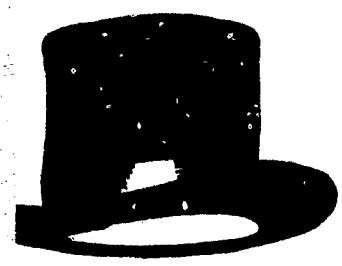
Figure IIa

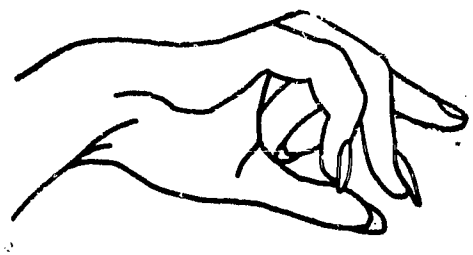
Book I--Number of Sentences and Mean Sentence Length per Story

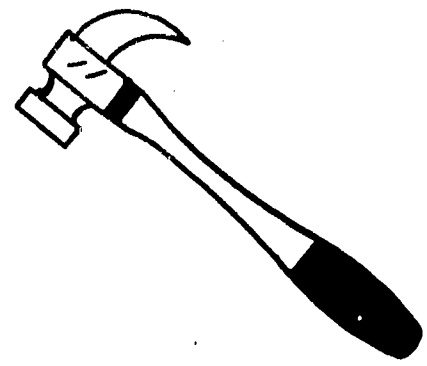
h H











hit
him

his
hid
hill
has

hi
high

hides
he
behind
hand

head

Figure III

Sample phonics page from Book II

cake lake cake

Sample item from colored word--multiple choice test

fat fun fan

Sample item from black and white word--multiple choice test

taffy

Sample item from colored word--oral reading test

nest

Sample item from black and white word--oral reading test

Figure IV

Sample items from four tests administered at the end of Book I

Table I. Pretest scores on the 20 Pilot Study Subjects; tests include Stanford-Binet Vocabulary, Modified Alphabet Test, Modified Harrison-Stroud Word Matching.

Test	Mean	Median	SD	Range
S-B Vocabulary (words)	6.0	6	1.1	4-8
Alphabet Naming* (less Q, X, Z)	6.3	0	8.0	0-21
Modified H.S.** Word Matching	21.2	20.5	6.8	9-31
C.A. (in months)	63	63	1.5	60-65

* Significantly related ($p < .05$) to the post test results on the Word Knowledge and Word Discrimination subtests of the Metropolitan Achievement Test.

** Significantly related ($p < .05$) to the post test results in the Word Knowledge subtest of the Metropolitan Achievement Test.

Table II. Means, medians, standard deviations and ranges of the scores on the four special tests administered at the completion of the first reader.

Test	No. Items	Mdn	Mean	SD	Range
Color Mul. Choice	15	15	14.10	1.50	9-15
Black Mul. Choice	14	12	11.50	1.41	8-14
Color Single Word	15	13	12.20	3.26	2-15
Black Single Word	14	9	8.45	2.80	2-12

Table III. Means, medians, and ranges of grade equivalent scores on three subtests of the Metropolitan Achievement Test administered at the end of the seven month teaching period.

Subtest	Mean	Median	Range
Word Knowledge	2.4	2.3	1.4-3.2
Word Discrimination	2.6	2.5	1.4-3.6
Reading	1.9	1.7	1.4-3.7